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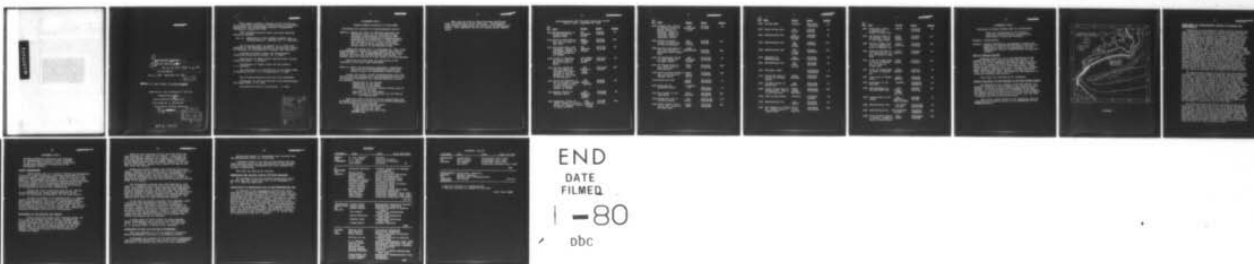
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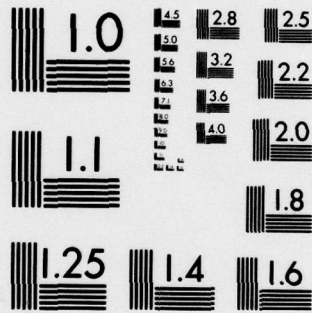
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OCEANOGRAPHIC RESEARCH.

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Periodic Status Report.

No. 9, 1 Jul - 30 Sep 48.

for the Period

July 1, 1948 - September 30, 1948

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APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

Submitted to the Oceanographic Division

Hydrographic Office

Under Contract No. 15 N6onr-277

Task Order No. 1, NR-083-004

With Office of Naval Research

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ABSTRACT
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This report contains a summary of work carried out by the Woods Hole Oceanographic Institution on assignments requested by the Oceanographic Division, Hydrographic Office, H.O. Project No. 4702.

ABSTRACT

The following Technical Report has been submitted during the quarter.

No. 13. HYDROGRAPHY OF THE WESTERN ATLANTIC; Note on Charting Methods. Prepared by F. C. Fuglister.

The following papers by members of our staff were presented at the September meeting of the American Society of Limnology and Oceanography at College Park, Maryland:

Plankton of Inshore Waters and the Ecological Conditions Governing its Growth. G. A. Riley.

Trajectories of Small Bodies Sinking Slowly through Convection Cells. H. Stommel.

The Exchange of Oxygen across the Sea Surface. A. C. Redfield.

The Distribution of the Effluent of the Hudson River on Entering the Sea. B. H. Ketchum and W. L. Ford.

The following demonstrations were also presented:

Photography of the Ocean Bottom in the Mediterranean and Aegean Seas. D. M. Owen.

Oceanographic Methods and Research. J. Hahn.

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ASSIGNMENT 4702-A

(Former BuShips Problem 1C of NObs-2083)

Processing and analysis of bathythermograph records.

- 4702-A-1 Within the limit of available personnel and facilities carry out all necessary filing, charting, photographing, and clerical work involved in the processing of bathythermograph observations collected by U. S. Navy vessels and activities, by U. S. Navy contractors, and by other agencies approved by the Hydrographic Office, in the Atlantic Ocean.

During the period July 1 to September 30, 1948, 5,028 bathythermograph records have been received from sources shown in Table 1. The bathythermograph slides are photographed, the positions plotted and the data copied. At present there is a backlog of 5,561 slides to be photographed.

This work was done under the supervision of Mr. Fuglister by four full time technicians.

- 4702-A-2 Carry out preliminary examination, tabulations and analyses of bathythermograph records necessary to make the information readily usable.

During the quarter, 9,642 bathythermograph cards and station data from publications were examined and from each the following information was recorded whenever it could be obtained.

- Temperature at the surface
- Temperature at 100 meters
- Temperature at 200 meters
- Temperature difference between surface and 30, 50 and 150 feet
- The depth of the mixed layer
- Rate of change of temperature per 100 feet in the thermocline.

These data were distributed in the geographical file in groups classified by months and by 30 minute quadrangles. The geographical file now contains,

- 92,127 bathythermograph cards
- 24,359 station data cards
- 7,732 surface data cards
- 2,838 mean surface data cards
- 127,056 total

This work was done by three full-time technicians under the supervision of Mr. Fuglister. Approximately 7,300 surface temperatures were copied for the Hydrographic Office. This completed the job of copying 19,800 temperatures.

**Bathythermograph Data Received during the Period
July 1, 1948 - September 30, 1948**

<u>Acc. No.</u>	<u>Area</u>	<u>Vessel</u>	<u>Dates</u>	<u>Number</u>
1115	Mid-Mediterranean to Ionian Islands to Quarnero Gulf	USS STRIBLING DD-867	V/22/48 V/27/48	36
1116	South of Cape Race to Sta. 4-B to south of Cape Race.	USCGC SPENCER W-36	VI/9/48 VII/4/48	153
1117	Off Puerto Rico, off Fishguard, England to off Bergen, Norway to Gotsborg, Norway to off Lisbon	USS JOHNSTON DD-821	II/17/48 VI/11/48	49
1118	Strait of Gibraltar to Athens. East of Malta to Crete to Malta	USS ROBERT H. McCARD DD-822	III/9/48 V/29/48	80
1119	Off Cape Serrat to Gulf of Athens to off Malta to Ionian Islands to Sea of Marmara to off Milos to Persian Gulf	USS CHARLES H. ROAN DD-853	III/11/48 V/21/48	200
1120	Strait of Gibraltar to Sea of Marmara to Lemos to Port Said to Aden, Arabia to Bahrein, Arabia, to Hanjam	USS RENDOVA CVE-114	IV/4/48 V/22/48	88
1121	Nyeres, France to Valetta, Malta	USS SAMUEL B. ROBERTS DD-823	IV/19/48 IV/21/48	23
1122	Argostoli, Greece to Izmir, Turkey to Piraeus, Greece to Salonika, Greece to Leros to Malta	USS SAMUEL B. ROBERTS DD-823	V/10/48 VI/2/48	145

<u>Acc. No.</u>	<u>Area</u>	<u>Vessel</u>	<u>Dates</u>	<u>Number</u>
1123	Phaleron Bay, Greece to Skyros, Greece to Milos, Greece to Iraklion, Crete to Kalamata, Greece to Suda Bay, Crete to Argostoli, Greece	USS MANCHESTER CL-83	V/19/48 VI/7/48	69
1124	Trieste to Corfu, Greece to Malta Area to Gulf of Kalamata	USS DAYTON CL-105	V/27/48 VI/7/48	107
1125	South of Cape Race to Sta. #2 to south of Nantucket Shoals Light-ship	USCGC ANDROSCOGGIN	V/29/48 VII/3/48	200
1126	Off Cephalonia Island to Corfu Island to Pelagosa Island	USS STRIBLING DD-867	VII/11/48 VII/16/48	15
1127	Off Virgin Rocks to sta. #2 to east of Newfoundland	USCGC BIBB	VI/22/48 VII/19/48	144
1128	North of Sable Island to sta. 4-B to south of Georges Shoals	USCGC SEBAGO WPG-42	VI/28/48 VII/29/48	195
1129	Baffin Bay Area	USCGC INEHAM	VII/29/48 VII/30/48	12
1130	Woods Hole to Nantucket Shoals	ALBATROSS III	VIII/4/48 VIII/6/48	19
1131	Nova Scotia to off Cape Union	USCGC EASTWIND	VII/16/48 VIII/6/48	200
1132	Baffin Bay Area to off Nova Scotia	USS EDISTO	VIII/11/48 VIII/17/48	113
1133	South of Nova Scotia to sta. #2. Return to off Cape Race	USCGC DUANE	VII/10/48 VIII/9/48	169

<u>Acc. No.</u>	<u>Area</u>	<u>Vessel</u>	<u>Dates</u>	<u>Number</u>
1134	Off New York	ASTERIAS	VIII/2/48 VIII/11/48	42
1135	South of Key West	USS HOLDER	XI/6/47 V/24/48	95
1136	Mediterranean Sea	USS BROWNSON DD-868	III/8/48 VI/4/48	98
1137	Mediterranean Sea	USS CONE DD-866	V/20/48 VI/26/48	145
1138	Mediterranean Sea	USS O'HARE DD-889	V/21/48 VII/28/48	300
1139	Gibraltar to Mediterranean	USS COLUMBUS	VI/19/48 VII/14/48	80
1140	Mediterranean Sea	USS FARGO CL 106	VI/30/48 VII/1/48	18
1141	Nantucket Sound		VIII/21/48 VIII/22/48	5
1131	Baffin Bay Area to Arctic to off Nova Scotia	USCGC EASTWIND	VIII/7/48 IX/19/48	395
1132	Off Nova Scotia to Baffin Bay	USS EDISTO	VII/17/48 VII/27/48	17
1142	South of Cape Race to Station #4-B. Return to off Cape Race	USCGC DEXTER (WPG-385)	VII/22/48 VIII/14/48	162
1143	East of Long Island	RELIANCE	VII/30/48 IX/3/48	14
1144	Mediterranean Sea	USS HENLEY	VI/16/48 VII/23/48	92
1145	Off Argentina to station #2. Return north of Virgin Rocks	USCGC OWASCO (WPG-39)	VIII/3/48 VIII/31/48	133

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<u>Acc. No.</u>	<u>Area</u>	<u>Vessel</u>	<u>Dates</u>	<u>Number</u>
1146	Woods Hole, midway to Bermuda and return to Woods Hole	MENTOR	IX/11/48 IX/13/48	78
1147	Off Virgin Rocks to station #2. Return to off Virgin Rocks	USCGC INGHAM WPG-35	IX/23/47 X/29/47	167
1148	South of Virgin Rock to off Argentina to south of Flemish Cap	USCGC EVERGREEN	IV/16/48 VI/18/48	173
1149	South of Cape Race to off Virgin Rocks. Return to south of Cape Race	USCGC MENDOTA	IV/28/48 V/14/48	42
1150	South of Virgin Rocks to south of Flemish Cap to south of Virgin Rock	USCGC MACOMA	V/16/48 VI/21/48	107
1151	South of Virgin Rocks to south of Flemish Cap	USCGC MENDOTA	V/22/48 VI/5/48	73
1152	Area south of Virgin Rocks	USCGC MENDOTA	VI/22/48 VII/1/48	84
1153	Woods Hole to off New York	BALANUS	VII/23/48 VII/28/48	90
1154	Off Charleston to Mediterranean Area	USS JAMES C. OWENS (DD 776)	IV/4/48 VII/7/48	197
1155	Persian Gulf to off Cyprus	USS CHARLES H. ROAN (DD 853)	V/22/48 VI/1/48	47
1156	Mediterranean Area	USS FARGO (CL-106)	VIII/11/48 VIII/13/48	32
1157	Mediterranean Sea	USS STRIBLING (DD 867)	VIII/5/48 VIII/16/48	131
1158	South of Nova Scotia to Arctic. Return to south of Nova Scotia	USS EDISTO	VIII/26/48 IX/24/48	194

ASSIGNMENT 4702-B

(Extension of Former BuShips Task 12 of NObs-2083)

Study the oceanography of the Atlantic Ocean and conduct necessary oceanographic experiments, surveys and analyses.

4702-B-1 (Confidential)

4702-B-2 Conduct experiments, oceanographic surveys and analyses of existing and new data in the Atlantic Ocean with a view to the preparation for the Hydrographic Office of comprehensive oceanographic studies.

Note on charting methods.

Technical Report No. 13 on the HYDROGRAPHY OF THE WESTERN ATLANTIC was submitted during the quarter. In this report it was suggested that because many transition zones in the oceans are quite narrow and abrupt, charts should be constructed so as to show them as such. Since charts based on averaged data tend to broaden and minimize these gradients some other method of charting should be used. The schematic chart, see Figure 1, was suggested as a method of meeting this problem.

This report was prepared by Mr. Fuglister.

Monthly Variations in the Velocity of the Gulf Stream System.

In preparation for a survey of the Gulf Stream, the seasonal variation in the strength of the current is being studied. As shown by Iselin and Montgomery the average velocity of the Gulf Stream is at a minimum in the autumn. The present study indicates that this is the case throughout the entire Gulf Stream System but it appears that the time of maximum velocity varies considerably.

This study, being prepared by Mr. Fuglister, will be submitted as a technical report on the HYDROGRAPHY OF THE WESTERN ATLANTIC.

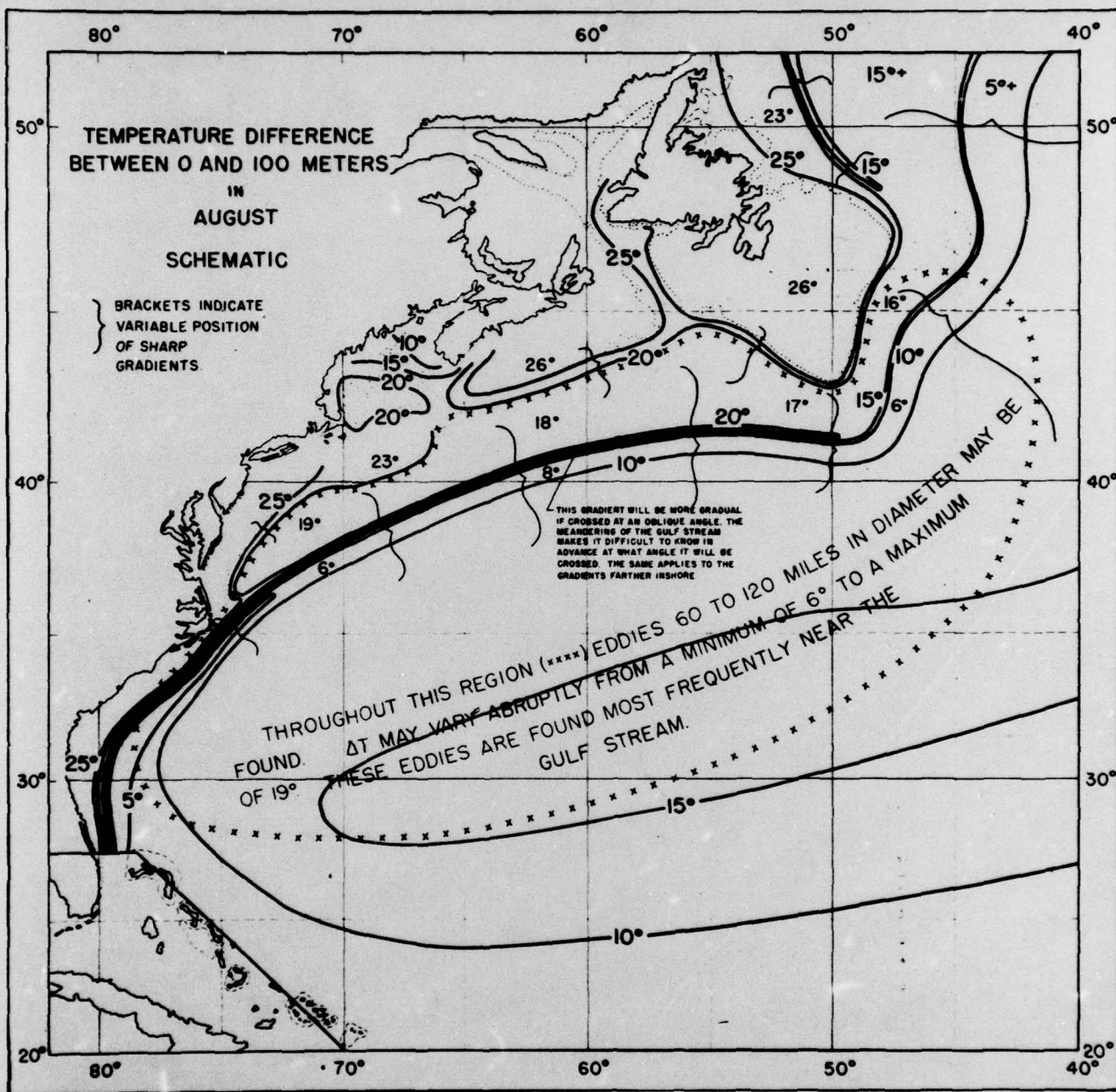


FIGURE 1

Development of electromagnetic methods of measuring sea water motions.

Comparison of electromagnetic water current observations with those deduced from dynamic computations made during the 1948 International Ice Patrol season is in progress. The method employed is to compute the average water current over the interval between hydrographic stations from half-hourly electromagnetic water current observations and induce from this the slope of the dynamic topography. This slope compared with the slope observed through measurements of the density columns at a pair of stations permits comparison of the two methods. Early results show a random discrepancy between the two methods. The average discrepancy is 0.4 mm/mile but individual values are as high as 10.0 mm/mile. Tidal motions measured by the electromagnetic method and not measured by the method of density columns account for some of the largest discrepancies, especially in shoal waters. The standard deviation of all non-tidal observations is 5.8 mm/mile. Discrepancies of the order of 1.0 mm/mile exist randomly in deep water and may be due to use of half-hourly "spot" values of water velocity rather than continuously integrated water motion between the hydrographic stations. Further study of the data is contemplated and further tests of the method are planned for the coming Ice Patrol season.

The engineering problems associated with electromagnetic measurements of water currents below the surface are largely resolved. Towing heads for both surface and deep towing are nearing completion. Tests of the towing head design show a high degree of directional stability as well as a drag of the order of 15 pounds at 12 knots. Special cables are being designed for bringing the electrical signals aboard and for withstanding the large strains of deep towing. A recorder is on order which will record the surface and deep water motion signals simultaneously. The new instrument will be equipped with auxiliary pens for printing the heading of the electrodes on the strip chart every half-minute. This is expected to increase the accuracy of measurement and quality of information as well as make the instrument almost automatic so that a man on watch will be free to put his attention on other work most of the time.

The audio and higher frequency electrical noise in the earth and in the local arms of the sea is under continuous observation. Two months of records obtained on the 0.5 km range in the harbor are being studied for correlations with the magnetic traces from the Cheltenham Magnetic Observatory and reports of 3-hourly K-indices from the same source. The recorder mentioned in the foregoing paragraph will also be used to compare the audio frequency electrical disturbance trace with potentiometric traces of earth current potentials along the same and other electrode ranges.

Tables for the determination of Sigma-t.

Tables for the determination of sigma-t have been prepared by Messrs. D. Martineau and D. F. Bumpus. They cover the range in salinity from 36.0 to 40.0 ‰ and from 10.00 to 30.00°C.

Bottom sediments in Long Island Sound and contiguous rivers.

One hundred and twenty samples of bottom sediment were collected with Phleger bottom samplers from the eastern part of Long Island Sound, 23 August to 29 August. Two traverses were made from near the Connecticut River to near the Housatonic River and additional traverses were made in Gardiner's Bay. Traverses were also made 10 miles up the Connecticut River and 5 miles up the Housatonic River. These samples were collected to extend the knowledge of the distribution of bottom sediments in the region. The sediments and Foraminifera will be studied at a later date. The field work was carried out by Mr. C. R. Hayes under the supervision of Dr. F. B. Phleger, Jr.

Transparency of ocean waters.

During a recent cruise of the ATLANTIS comparison of depths at which 20 cm colored discs could be seen was compared with a standard white 20 cm Secchi disc. Over a range of Secchi disc depths of 5 to 35 meters, (extinction coefficients 0.34 to 0.05) yellow, green, and blue discs could be seen approximately 0.8 times as far as the white disc, while the red, purple and black discs could be seen approximately 0.4 times as far. A white disc 40 cm in diameter could be seen 1.2 times as far as the 20 cm disc. This is an extension of work carried out during the ATLANTIS Mediterranean Cruise in which the red and 40 cm discs were compared with the standard disc. The work was carried out by Dr. L. W. Hutchins.

Search and Answer Service.

Descriptions, plans, costs and references of various types of bottom coring equipment were sent to the Oceanographic Division, Hydrographic Office at their request. The equipment discussed were the "Stetson-Hvorslev Core", "Trask-Hough Core", and "Phleger Sampler". The material was prepared by Mr. C. R. Hayes.

A detailed description of methods used at this Institution for the correction of deep sea reversing thermometers, using the "Reversing Thermometer Slide Rule" has been forwarded to the Hydrographic Office, Oceanographic Division at their request. This description also included the methods used for thermometric determination of depth. This information was prepared by Mr. D. F. Bumpus.

ASSIGNMENT 4702-C

Provide assistance, facilities and personnel, in oceanographic problems of mutual interest to the U. S. Navy activities and to contractors of the Navy Department as approved by the Hydrographic Office.

Arctic oceanography.

Early in May, Mr. W. G. Metcalf visited the Hydrographic Office for a final conference concerning his reports on the previous summer's Arctic Operation. Parts III and IV of the Report on the Oceanographic Program of the U. S. Naval Arctic Operation, Summer 1947, entitled 3) Submarine Diving Conditions in Arctic Waters and 4) Oceanographic Observations in the Greenland-Canadian Arctic were submitted to the Division of Oceanography in May and June respectively.

During the visit, plans were made for Mr. Metcalf to participate in the coming summer operation in the Arctic for additional oceanographic and ice observations.

On July 15, Messrs. W. G. Metcalf and J. B. Wickham sailed for the Arctic with U. S. Naval Task Force Eighty where bathythermograph observations, hydrographic stations and studies of sea ice were made. The two observers returned from the Arctic at the end of September. Mr. Metcalf is now working up reports of this cruise. Mr. Wickham has returned to Scripps Institution of Oceanography.

Development of the Multiple Sea Sampler.

Tests of the Sea Sampler were continued aboard the U. S. Fish and Wildlife Service vessel, ALBATROSS III. Objectives of the tests were (1) to make several hydrographic sections while underway by using the Sea Sampler exclusively, (2) to compare the performance of the Sea Sampler with an ordinary bathythermograph, and (3) to develop a semi-micro technique for the titration of samples for oxygen.

Three to four lowerings an hour were made while the ship traveled at a speed of 10.5 knots. A good part of this time between lowerings was consumed in transferring and preparing the salinity and oxygen samples obtained. At the speed mentioned the Sea Sampler dropped to 400 feet with no difficulty. Samples were obtained as deep as 316 feet below the surface.

Oxygen and salinity samples were titrated aboard the vessel. Because of the limited size of the samples (120 cc), oxygen titration was made by semi-micro modification of the Winkler method which used only 1/4th of the sample, leaving the remainder for salinity titration. A paper is being prepared describing this modification which was devised by Mr. H. J. Turner.

Two hydrographic sections were made parallel to each other in a southerly direction across the 200 fathom curve south of Nantucket Island. These sections were hydrographically interesting for both showed that they had crossed a boundary condition between two water masses. The Sea Sampler made it possible to collect samples more closely spaced in time and distance, both horizontally and vertically, than samples which could be taken with Nansen bottles.

It has been the general practice, when computing sigma-t densities from hydrographic stations, to treat as questionable data reversals of densities occurring in a vertical. Hence, some doubt arose as to the validity of the data obtained because the occurrence of so many density reversals could not be ignored. However, careful analysis of the data and investigations of data on record from this region show that density inversions and consequent subsurface instability are not uncommon.

A paper based on these studies is being prepared. These investigations were conducted under the direction of Dr. A. F. Spilhaus assisted by Mr. A. R. Miller and Lt. A. Ehrlich, USAA, a student of Dr. Spilhaus.

Calibration of deep sea reversing thermometers.

Work was completed on 5 of the group of 15 National Museum thermometers mentioned in the previous report.

Calibration was completed on 16 Institution thermometers used on ATLANTIS Cruise 151, and a group of 59 thermometers belonging to the Hydrographic Office was also completed.

During this period 71 thermometers were received from the Hydrographic Office for calibration.

A pressure vessel to be used in conjunction with the fluid pressure scale for the determination of the pressure factor of unprotected thermometers has been designed and is under construction.

This work was done by Mr. Penrose.

Temperature and salinity surveys off North Carolina.

The analysis of the data gathered during this survey has been set aside temporarily due to the assignment of Mr. T. J. Wehe to other work.

Distribution of hydrographic data in the Mediterranean Sea.

In addition to the hydrographic stations and bathythermograms collected by ATLANTIS during the early part of this year in the Mediterranean Sea, a large number of bathythermograms has been collected by units of the U. S. Navy during the past year in that region. Consequently, monthly charts of the distribution of hydrographic data in the Mediterranean Sea have been prepared showing the distribution of temperature and salinity data and bathythermograms on the basis of 30' quadrangles. These charts should be useful to the Hydrographic Office and ComNavMed in showing where this type of oceanographic information is lacking. These charts have been prepared by Mr. A. H. Clarke under the supervision of Mr. M. J. Pollak.

PERSONNEL

ASSIGNMENT	NAME	TITLE	TOTAL MAN DAYS*
GENERAL TASK ASSIGNMENT	C. O'D. ISELIN**	Director	25
	A. C. Redfield	Associate Director	
	F. C. Ryder	Assistant to Director	
	Lois Krance	Secretary	
BT PROCESSING AND ANALYSIS	Frederick Fuglister	Research Associate in Physical Oceanography	715 3/4
	Gloria Clark	Statistical Clerk	
	Elizabeth Diaco	Senior Laboratory Technician	
	Beverly Emery	Laboratory Technician	
	Eileen Scharff	Senior Statistical Clerk	
	Evangelina Tollios	Senior Statistical Clerk	
	Harriett Hodgkins	Statistical Clerk	
	Marjorie Myers	Statistical Clerk (2 months)	
	Sondra Ofstrook	Statistical Clerk	
	Cecelia Simons	Statistical Clerk	
	Marion Wormald	Statistical Clerk (part time)	
	Marilyn Young	Laboratory Technician	
	Jean French	Laboratory Assistant (part time)	
	Adelma Senate	Laboratory Assistant (part time)	
	Anne Webster	Laboratory Technician (1 1/2 months)	
HYDROGRAPHIC OBSERVATIONS AND ANALYSES	Arnold Clarke	Hydrographic Technician (1 1/2 mos.)	232 1/2
	Carlyle Hayes	Hydrographic Technician	
	Edward Penrose	Research Associate in Physics (1 month)	
	Dean Bumpus	Associate in Oceanography (part time)	
	Donald Martineau	Hydrographic Technician (part time)	
	Theodore Wehe	Hydrographic Technician (part time)	
	Irving Schell	Research Associate	
CURRENTS AND WAVES	Barbara Allen	Statistical Technician	439 1/2
	Mary Gifford	Statistical Technician	
	Henry Stommel	Research Associate in Physical Oceanography	
	William von Arx	Research Associate in Physical Oceanography	
	H. R. Seiwel	Physical Oceanographer (part time)	
	Charles Parker	Hydrographic Technician (1 1/2 mos.)	
	Nora Stone	Statistical Technician (2 months)	
	Barbara Atwood	Junior Technician	
	Frances Magen	Secretary	
	Bernhard Haurwitz	Associate in Marine Meteorology (part time)	
	Frank Mather III	Hydrographic Technician (part time)	
	Richard Dimmock	Technician	
	Louise Dudley	Stenographer	

PERSONNEL (cont'd)

ASSIGNMENT	NAME	TITLE	TOTAL MAN DAYS
PHOTOGRAPHY AND DRAFTING	Claude Ronne	Photographer (part time)	
	John Stimpson	Draughtsman (part time)	
	Eva Shelnut	Draughtsman (part time)	
	Ann Silva	Laboratory Assistant (part time)	
			70½

MISCELLANEOUS SHOPWORK AND LABORATORY ASSISTANCE	Electronics, Carpentry, Chemical Analyses, Machine Shop, Instrumentation, and Typing		115 1/4
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* Man Day consists of 8 working hours.

** Time not included in figures for man days.

Grand Total 1588½